BSC

Model Administrative Change Notice

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4. Title:	Drift-Scale THC Seepage Model				
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6. Approvals:

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7. Affected Pages	8. Description of Change:
5-3	Correction to the text. Section 5, assumption 6, fifth sentence, change: *"...water is diverted around the rubble zone, which extends to a radius of 11 m from drift center, due to capillary effects..."* To ***"...water is diverted around the rubble zone, which extends to a radius of 5.5 m from drift center, due to capillary effects..."*** Note: This statement provides justfication for an assumption in the document, and the change from 11 m to 5.5 m radius has no impact on the validity of the basis for the assumption, or on any other aspect of the document. This error was identified in CR 5353

(Section 6.4.1). Thus, reaction of aqueous components in concentrated (ionic strength greater than 4 molal) solutions does not occur. Transport is neglected if the liquid saturation drops below an input lower limit of 10^{-5}, which is also below the residual saturation, but takes place at all values of the ionic strength. At liquid saturations this low, the total amount of dissolved mass present in any given model grid block is exceedingly small. Thus, ignoring chemical reaction for such small mass amounts (and over a limited time period) does not significantly affect the general computed trends of aqueous phase concentrations and precipitated mineral amounts over long periods of time and a wide range of liquid saturations. The salt phases that are formed during dryout are described in Section 6.4.5. These phases are available for dissolution upon rewetting (using a relatively fast dissolution rate of 10^{-6} mol s^{-1} kg_{H2O}^{-1}).

5. **Axial transport effects would not significantly impact THC Seepage Model results—**The THC seepage model is a two-dimensional slice through an emplacement drift at the center of the repository. Transport of heat and mass (liquid/vapor) in the third dimension, paralleling the drift, are not incorporated into the model. The effect of such transport on water chemistry is assumed to be negligible. Confidence in this assumption is gained by comparing the two-dimensional THC model results (with water-rock interactions turned off) and the three-dimensional MSTHM results (BSC 2004 [DIRS 169565], Section 6.3) for a repository-center location. The two models predict similar drift-wall temperatures for given waste package temperatures. The maximum waste package and drift wall temperatures from the THC seepage model are around 164°C and 141°C, respectively (Figure 6.5-4). The MSTHM, for a similar mean infiltration case, predicts a drift-wall temperature around 139°C for the same waste package temperature (around 164°C) (BSC 2004 [DIRS 169565], Figure 6.3-2).

6. In the event of complete drift collapse, the composition of potential seepage is assumed to be the same as seepage for uncollapsed drifts—In the low-probability-seismic collapsed-drift scenario, the drift opening collapses, and the resulting host-rock rubble completely fills the modified drift opening, from the outer surface of the drip shield out to the modified “drift wall.” It is assumed that drift collapse will have no effect on potential seepage water compositions. Thermal-hydrologic simulation results for a complete drift-collapse scenario are presented in *Multiscale Thermohydrologic Model* (BSC 2004 [DIRS 169565], Section 6.3.7), and show that the main effect of the rubble is to thermally insulate the waste package, resulting in higher temperatures and extended boiling duration in the drift (relative to the no-collapse scenario). The effect of drift collapse on potential seepage compositions was evaluated in the now-historic *Abstraction of Drift-Scale Coupled Processes* (BSC 2004 [DIRS 169617], Section 6.3). Simulation results confirmed that the maximum waste package temperature increased, but also showed that water is diverted around the rubble zone, which extends to a radius of 5.5 m from drift center, due to capillary effects, such that the wetting front and high-saturation zones in the rock actually occur further from drift-center, and at lower temperatures (BSC 2004 [DIRS 169617], Section 6.3.5.2). Because it is waters at these locations that are sampled by the THC seepage model and passed to downstream models (see Section 6.5.5.2), and because lower temperature seepage waters are less corrosive than higher temperature waters (BSC 2004 [DIRS 169860], Section 6.13), this assumption is justified because it is conservative with respect to corrosion and radionuclide release.